

*AMENDMENTS TO THE CLAIMS*

This listing of claims replaces all prior versions, and listings, of claims in the application.

1. (Currently Amended) ~~Use of a biological photoreceptor as a light-controlled ion channel for the alteration of the ion conductivity of a membrane with the aid of light; A~~ method for altering the ion conductivity of a membrane, which method comprises inserting one or more biological photoreceptors into a membrane, wherein the one or more biological photoreceptors is configured to act as a light-controlled ion channel, and wherein the one or more biological photoreceptors photoreceptor used comprises an apoprotein and a light-sensitive polyene covalently bound to the apoprotein, said polyene interacting with the apoprotein and functioning as a light-sensitive gate, thereby altering the ion conductivity of the membrane.
2. (Currently Amended) ~~Use according to Claim 1, characterised in that The~~ method of claim 1, wherein the apoprotein is a transmembrane protein with 5 or more transmembrane helices.
3. (Currently Amended) ~~Use according to Claim 1, characterised in that The~~ method of claim 1, wherein the ~~ion transport system~~ light-controlled ion channel is a ~~proton~~ transport system for protons, sodium, or calcium.
4. (Currently Amended) ~~Use according to Claim 1, characterised in that The~~ method of claim 1, wherein the apoprotein is an opsin protein or a derivative or fragment of a naturally occurring opsin protein.
5. (Currently Amended) ~~Use according to Claim 4, characterised in that The~~ method of claim 4, wherein the opsin derivative or fragment is the result of an exchange and/or an insertion and/or deletion of one or several amino acid(s) in the natural amino acid sequence of the opsin protein.
- 6.-7. (Cancelled)
8. (Currently Amended) ~~Use according to Claim 1, characterised in that The~~ method of claim 1, wherein the apoprotein contains the consensus sequence L(I)DxxxKxxW(F,Y).

9. (Currently Amended) ~~Use according to Claim 1, characterised in that~~ The method of claim 1, wherein the apoprotein derives is derived from lower plants.

10. (Currently Amended) ~~Use according to Claim 9, characterised in that~~ The method of claim 9, wherein the lower plants are algae.

11. (Currently Amended) ~~Use according to Claim 10, characterised in that~~ The method of claim 10, wherein the apoprotein is an opsin protein from *Chlamydomonas reinhardtii*.

12. (Currently Amended) ~~Use according to Claim 1, characterised in that~~ The method of claim 1, wherein the apoprotein includes at least the amino acids 61 to 310 of the Channelopsin1 (CHOP-1) protein (SEQ ID NO: 1) ~~according to~~ SEQ ID NO: AF385748 (National Center for Biotechnology Information, NCBI).

13. (Withdrawn and Currently Amended) ~~Use according to Claim 1, characterised in that~~ The method of claim 1, wherein the apoprotein includes at least the amino acids 24 to 268 of the Channelopsin2 (CHOP-2) protein (SEQ ID NO: 2) ~~according to~~ SEQ ID NO: AF461397.

14. (Withdrawn and Currently Amended) ~~Use according to Claim 13, characterised in that~~ The method of claim 1, wherein the apoprotein includes at least amino acids 24 to 268 of the Channelopsin2 (CHOP-2) protein (SEQ ID NO: 2), except that the amino acid histidine at position 134 of the Channelopsin2 ~~according to~~ SEQ ID NO: AF461397 SEQ ID NO: 2 is replaced by another amino acid.

15. (Withdrawn and Currently Amended) ~~Use according to Claim 14, characterised in that~~ The method of claim 14, wherein the amino acid histidine at position 134 of SEQ ID NO: 2 is replaced by arginine.

16. (Withdrawn and Currently Amended) ~~Use according to Claim 4, characterised in~~ The method of claim 4, wherein that the opsin protein derives from protozoa.

17. (Withdrawn and Currently Amended) ~~Use according to Claim 4, characterised in~~ The method of claim 4, wherein that the opsin protein derives from bacteria or archaea.

18. (Withdrawn and Currently Amended) ~~Use according to Claim 4, characterised in~~ The method of claim 4, wherein that the opsin protein derives from fungi.

19. (Currently Amended) ~~Use according to Claim 1, characterised in that~~ The method of claim 1, wherein the light-sensitive polyene is a retinal or retinal derivative.

20. (Currently Amended) ~~Use according to Claim 19, characterised in that~~ The method of claim 19, wherein the retinal derivative is selected from the following group: group consisting of 3,4-dehydroretinal, 13-ethylretinal, 9-dm-retinal, 3-hydroxyretinal, 4-hydroxyretinal, naphthylretinal; 3,7,11-trimethyl-dodeca-2,4,6,8,10-pentaenal; 3,7-dimethyl-deca-2,4,6,8-tetraenal; 3,7-dimethyl-octa-2,4,6-trienal; and 6-7 rotation-blocked retinals, ~~or~~ 8-9 rotation-blocked retinals, and ~~or~~ 10-11 rotation-blocked retinals.

21. (Currently Amended) ~~Use according to Claim 1 for the light-controlled alteration of the~~ The method of claim 1, wherein the proton, sodium, or calcium conductivity of ~~the~~ a membrane is altered.

22. (Currently Amended) ~~Use according to Claim 1 for the light-controlled alteration of the~~ The method of claim 1, wherein the membrane potential of a cell membrane is altered.

23. (Currently Amended) ~~Use according to Claim 20, characterised in that~~ The method of claim 1, wherein the membrane is ~~the~~ a cell membrane of a yeast, e.g. *Saccharomyces cerevisiae*, *Schizosaccharomyces pombe* or *Pichia pastoris*.

24. (Currently Amended) ~~Use according to Claim 1, characterised in that~~ The method of claim 1, wherein the membrane is ~~the~~ a cell membrane of a mammalian cell or an insect cell, e.g. COS, BHK, HEK293, CHO, myeloma cell, MDCK or baculovirus-infected ~~sf9~~ cell.

25. (Currently Amended) ~~Use according to Claim 20 for the light-controlled raising or lowering of~~ The method of claim 20, wherein the intracellular concentration of ions across the membrane is raised or lowered.

26. (Currently Amended) ~~Use according to Claim 25 for the light-controlled raising or lowering of~~ The method of claim 25, wherein the intracellular ~~proton~~ concentration of protons, sodium, or calcium across the membrane is raised or lowered.

27.-31. (Cancelled)

32. (New) The method of claim 23, wherein the yeast is *Saccharomyces cerevisiae*, *Schizosaccharomyces pombe*, or *Pichia pastoris*.

33. (New) The method of claim 24, wherein the mammalian cell is a COS cell, a BHK cell, a HEK293 cell, a CHO cell, a myeloma cell, an MDCK cell, or a neuron.

34. (New) The method of claim 24, wherein the insect cell is a baculovirus-infected sf9 cell.

35. (New) The method of claim 20, wherein a light-induced membrane depolarization is realized.